UNITED STATES DEPARTMENT OF AGRICULTURE
Food Distribution Administration.
Fruit and Vegetable Inspection Service.

RECEIVING MARKET INSPECTION.
CITRUS FRUIT

Types

There are numerous types of citrus fruits found on the markets, chief of which are sweet oranges, comprising standard varieties, seedlings, blood oranges, etc; Mandarin oranges (tangerines, Satsumas, and King oranges); grapefruit (Pomelos); lemons, and limes. (1)

Producing Areas

The markets of the United States are largely supplied with citrus fruit grown in limited areas in a few States in which the temperature goes but little below freezing. Importations from foreign countries have declined during the last 20 years until they now offer but little competition with domestically grown fruit. In the United States the important commercial producing centers are in California, Florida, Texas and Arizona. Other producing sections of much lesser importance are located in Alabama, Louisiana, and Mississippi. (2)

California

The California producing districts are commonly-grouped into four sections designated as Desert, Southern, Central, and Northern. (3)

The Desert section includes the Coachella and Imperial Valleys, the acreage consisting principally of grapefruit. (4)

The Southern section comprises the Countries of Riverside, San Bernardino, San Diego, Orange, Los Angeles, Santa Barbara, and Ventura. This is the largest single producing area in the United States. (5)

(6) The Central Section is located along the foothills of the Sierra Nevada Mountains in the southern end of the San Joaquin Valley. The greater part of the plantings are in Tulare County with Porterville, Strathmore, Lindsay, and Exeter as the principal shipping points. Some plantings are found in Kern County on the south, and Fresno County on the north.

(7) The Northern section produces less than one percent of present shipments from California. The groves are located in the foothills east of the city of Sacramento in Sacramento County, and in the northern part of the Sacramento Valley in Butte, Tahama, and Glenn Counties, with Butte County leading in production at the present time.

(8) The principal varieties of oranges produced in California are the Washington Navel and Valencia, with some scattered plantings of Thompson Navels. The Navel is shipped between November and May, and the Valencia is shipped from April to Christmas.

(9) The March Seedless is the only grapefruit variety of importance grown in California. The majority of this fruit is shipped during the period from May to August.

(10) California has practically a monopoly of domestic production of lemons, very few being grown in Florida and Texas. The two important varieties are the Eureka and Lisbon.

Florida

(11) In Florida the citrus producing areas may also be roughly grouped into four sections, and designated as the East Coast Section, the Ridge Section, Central Section, and the West Coast Section.

(12) The East Coast Section is comprised of the Miami Section which ships the earliest grapefruit, and the Indian River Section embracing Brevard and St. Lucie Counties, both noted for fruit of exceptionally smooth texture and thin skin.

(13) The Ridge Section consists of Polk, DeSota, Highland, and Hardee Counties.

The Central Section is comprised of Orange, Lake, Seminole, Volusia, Putnam, Osceola, and Marion Counties. (14)

The West Coast Section takes in Pinellas, Hillsboro, Manatee, Lee, and Sarasota Counties. (15)

Florida oranges are largely of the seeded type. Numerous varieties are grown as compared with California. Parson Brown and Hamlin are the principal early varieties which are picked in October and early November. Hamlins are now beginning to come on the market from plantings of 5 to 8 years ago, and shipments will probably equal if not pass those of Parson Browns within the next few years. Hamlins are often packed and marked "Pineapples" or "Parson Brown." It is difficult to distinguish between these varities, and all three are sometimes mixed in the same package. (16)

Pineapple oranges are midseason fruit, in season from December through February, although sometimes held later. (17)

Parson Brown, Hamlins, Seedlings, (Seedlings as applied to citrus means unknown varieties), Pineapples, and Valencias constitute the great bulk of shipments from Florida. (18)

Valencias are late oranges being harvested from the first of February through May. At the present time this variety makes up nearly 40% of the total orange shipments from Florida. (19)

There are four leading varieties of grapefruit - Royal, an early variety; Duncan and Walters, midseason; and Marsh Seedless, a late variety. Florida grapefruit shipments start in September and continue until July, the heavy movement occurring during January, February, and March. (20)

Among the tangerines the Dancy is the principal variety. The Temple and King oranges are well known loose-skinned varieties, the former being of much better quality. (21)

Texas

In Texas the main citrus producing area is in what is commonly called the Lower Rio Grande Valley. This section consists mainly of Cameron, Hildalgo, and Willacy Counties. North of these Brooks and Jim Wells Counties produce a small amount of grapefruit and oranges. The Laredo and Winter Garden sections consisting of Webb, Dimmitt, Zavalla, and Frio Counties have scattered citrus groves, but no car lots have been shipped from these Counties (22)

(23) Texas grows the same varieties of citrus as Florida, with about the same shipping periods. The season generally opens about October 1st. Approximately three-fourths of the grapefruit crop consists of Marsh Seedless, and other seedless varieties; the remainder Duncan, and other seeded types. The orange crop is about one-fifth of the citrus tonnage moved from Texas. The crop consists mostly of seeded varieties, Parson Browns being the principal variety shipped in the early part of October and through November. This variety is followed by Pineapples in midseason, along with most of the Navels. The Valencia crop follows in the latter part of the season. There are many unnamed seedling oranges which are shipped along with the principal varieties named.

Gulf Coast States

(24) Alabama, Louisiana, and Mississippi grow the Satsuma oranges. The shipments from these three States are very light, and very few ever reach the large markets. Louisiana also grows a number of seedling varieties in the delta section. These are practically all sold within the State.

Arizona

(25) The principal varieties of oranges grown in Arizona are the Navels and Valencia which are generally marketed before Christmas.

(26) The Marsh Seedless constitutes the main variety of grapefruit from this State. A few Duncans are produced. The shipping season extends from about the first of November to June first, with the peak movement occurring in March and April.

Puerto Rico

(27) The citrus imports from Puerto Rico to the United States consist principally of grapefruit. Grapefruit is exported from Puerto Rico the year round, but the months of May, June, and August through October are the months of heaviest movement. From October to March shipments to the United States diminish and much of the fruit moves to foreign markets, especially the United Kingdom.

The citrus section is on the north coast of Puerto Rico, extending from the vicinity of San Juan to Arecibo. (28)

The principal varieties grown in this section are Marsh Seedless and Duncan. (29)

THE INSPECTION CERTIFICATE

See Same Heading I.H.B. - Part II.

Regulation 4, section 15, as amended on May 1, 1939, provides that the "The inspector shall sign and issue a separate certificate for each lot inspected by him, except that when an application covers a number of less-than-carload lots a single certificate may be issued to cover all such lots." When a car contains oranges, grapefruit, tangerines, or other citrus fruits, all should be covered in the body of a single certificate. If the request is for condition only the regular $2.50 carlot fee should be charged. If the car contains one-half car, or less, the regular $2.50 charge should be made. If the request is for grade on two or more products in one car, a single certificate should be issued showing all products in the body of the certificate. The usual grade inspection fees should be charged, the maximum fee for a single car being $7.50. If it is impractical to cover all products in a car on a single certificate two or more may be issued. (30)

CONDITION OF CAR

See Same Heading I.H.B. - Part II.

PRODUCTS INSPECTED AND DISTINGUISHING MARKS

See Same Heading I.H.B. - Part II.

The following information should be given under this heading: (31)

(1) Type of fruit inspected. (Varieties in some cases).

(2) Type of container.

(3) Quantity inspected, if not a full carload in car.

(4) Identifying marks.

(5) State of origin, if known.

Type or Variety.

(32) When boxes are marked with the name of the variety these should be quoted rather than a positive statement made as to variety except as authorized in paragraph 34.

(33) In marketing lemons no distinction is usually made between varieties, all being shipped simply as lemons.

(34) As a general policy, the inspector should not attempt to certify the variety on oranges with the exception of Kings, Temples, and Valencias from California, since these can with certainty be distinguished from other varieties and Navels which may be certified as "Navels" without attempting to show whether Washington Navels or Thompson Navels. This is true even with such common varieties as the Pineapple and the Valencia whose characteristics are influenced by root stock, type and drainage of soil and the fertilization, cultivation and cultural varieties of the grove. Requests for variety certification should be declined with an explanation that the law under which the Inspection Service operates does not cover variety certification.

Types of Container.

(35) Most domestic fruits are packed in boxes with a center partition, the wire-bound crate of various sizes, and half boxes. Some growers use half bushel and bushel baskets to a limited extent.

(36) The open mesh bag is coming into widespread use as a container for both oranges and grapefruit. The popular sizes for oranges are bags holding 1 standard box, 1/2 box, 8 pounds, and 5 pounds. The first two are also commonly used for grapefruit.

(37) In the last year some shippers in Florida have used to limited extent a box known by the trade name "Superbox." This box has the same cubical contents as the Standard box and is of the same construction as the Standard box except that there is no center partition. This box should be reported on the certificate as "Standard Boxes, without partitions."

Half boxes are often referred to as "half straps" from the method sometimes practiced of strapping two half boxes together for shipping. They are used mainly for packing tangerines, Mandarins, Kings, and Satsumas. (38)

In California half boxes are used for tangerines, and small sized varieties of oranges, like Bloods, and St. Michaels. They are frequently used, without center partition, for grapefruit. (39)

Packed boxes of Italian lemons have ranged in weight from seventy to seventy-five pounds net, cargoes averaging around seventy-two to seventy-four pounds per box, net. The railroad tariffs in the United States have been based on an estimated weight of eighty-five pounds. (40)

The type of container should always be mentioned under this heading without going into too much detail, except for odd size containers. (41)

See Same Heading I.H.B. - Part II.

Identifying marks.

The certificate under this heading should contain complete data as to brands and grades when shown on the package. The sizes, varietal name, and "color added" when stamped on the containers or fruit should be reported under this heading. Thus: Stamped "Color Added, Valencia," and to denote size, (126 to 324 sizes noted). (42)

Examples:

1. Oranges in boxes labeled "Star Brand, Fla." and stamped, "U.S. No. 1, Pineapple," and to denote size, (126 to 250 sizes noted). (43)

2. Tangerines in 4/5 bushel wire-bound crates labeled "Half Moon Brand, Fla.", and stamped "U.S. No. 1," and to denote size, (120 to 216 sizes noted). Applicant's count 800 crates. (44)

3. Oranges in 1 3/5 bushel wire-bound crates labeled "Gem Brand, Texas," and stamped "U.S. No. 1, Color Added, Valencia," and to denote size, (126 to 288 sizes noted). Manifest shows 400 crates. (45)

(46) 4. Temple oranges in half boxes labeled "Blue Blook Brand, Texas," and stamped to denote size, (120 to 216 sizes noted).

(47) 5. Navel oranges in boxes labeled "Red Crown Brand, Calif." and stamped to denote size, (126 to 220 sizes noted).

CONDITION OF LOAD AND CONTAINERS

See Same Heading I.H.B. - Part II.

(48) The strapping of boxes for export should be reported under this heading.

CONDITION OF PACK

See Same Heading I.H.B. - Part II.

Wrapping.

(49) When the fruit in the standard box is not wrapped, this fact should be reported under the Pack heading. Thus: "Oranges not wrapped." In oranges and tangerines of 250 and smaller sizes where the fruit in the center portion of the box is not wrapped, it is not necessary to mention this fact since it is permissible under the standard Pack. However, any deviation from that permitted under Standard Pack should be reported. Fruit in the wire-bound box usually is not wrapped and no mention of this fact is necessary.

(50) Citrus packs should be judged both according to the bulge and firmness of the pack.

(51) In addition to the statement concerning condition of pack it will sometimes be desirable to mention the bulge. As a rule when the bulge is sufficiently high to indicate a satisfactory pack, it need not be mentioned. Unusual conditions, when the bulge is 2 to 3/4 inches high, or when it is too low to be satisfactory and the cover show practically no bulge, should be reported. Some packs may have a high bulge, but the pack will loose, while, on the other hand, flat packs will at times be found with the fruit tight in the box. Wire-bound boxes are not expected to have as high a bulge as standard boxes.

Tightness of pack.

The following terms should be used to describe packs:

Very tight - meaning that the pack is too tight and tends to cause injury. (52)

Tight - meaning that both pack and bulge are satisfactory. (53)

Fairly tight - meaning the condition between "tight" and "slack," that is, tight enough to prevent the specimens from moving within the package, but not as nearly ideal as a "tight" pack. This condition should be qualified in the case of the standard box by a statement giving the height of bulge which may frequently be found below 1 1/2 inches. (54)

Slack - meaning that the package is not full. This statement should also be qualified by showing how much fruit is below the level of the lid. (55)

Examples:

(1) Tight pack in most boxes; many other boxes show pack 1/2 inch slack to level full.

(2) Fairly tight lids showing 1/2 to 1 inch bulge.

In determining the fill of wire-bound boxes the inspector should take into consideration whether the package is on a rigid surface, such as a car or pier floor, or whether it is resting on the ends of other crates of fruit which might permit the bottom side to become convex. This would make the crate appear slack at the top side while in reality it is fairly well filled. (56)

In reporting height of the pack the average level of the top layer fruits should be used. (57)

Standard pack

Most of the U.S. Grades have defined the term "Standard Pack." It is satisfactory to certify on the basis of "Standard Pack" as well as on the U. S. Grades. A load may meet the requirements of the U.S. Grades and not meet the requirements of "Standard Pack," and vice versa. (58)

(59) The actual certification of Standard Pack should be made under the Grade heading in connection with the grade statement but the tightness of pack, and the uniformity of sizing under the Size heading which are part of the requirements of Standard Pack should be shown under the Pack heading.

TEMPERATURE OF PRODUCT

See Same Heading I.H.B. - Part II

SIZE

See Same Heading I.H.B. - Part II

(60) A knowledge of the manifest of a car of citrus fruit is essential to a satisfactory size inspection. The inspector should select samples from each important size of each brand. When there is a material difference in quality or condition in different brands or sizes, report each group separately. This applies particularly to "small off" or "large off" sizes.

(61) The same packs are used for both Florida, Texas, and California fruit. The difference in box sizes is taken care of by the varying diameter of the fruit used. Florida and Texas fruit of a given pack is larger than California fruit.

(62) Sizes are referred to in terms of number of fruits to the box.

(63) Oranges: The general range in sizes in standard size boxes or crates are: 80, 96, 100, 112, 126, 150, 176, 200, 216, 220, 288, 324, and 344.

(64) Temple and King Oranges: in 4/5 bushels boxes or crates - 54, 64, 70, 80, 96, 120, and 150.

(65) Temple and King Oranges: in 1/2 boxes - 42, 48, 54, 60, 76, 90, 106, 120, 144, and 168.

(66) Tangerines: in 4/5 bushel boxes or crates - 100, 120, 150, 176, 200, 210, and 246.

Tangerines and Satsumas: in half boxes - 48, 60, 76, 90, 106, 120, 144, 168, 196, 216, 224, and 252. (67)

Lemons: in standard boxes - 210, 240, 270, 300, 360, 420, 442, and 490. (68)

Grapefruit: in standard boxes or crates - 28, 36, 46, 54, 64, 70, 80, 86, 112, 126, and 150. (69)

In the case of boxed fruit the important item is "sizing" rather than "size," and the certificate should show whether sizing is "uniform," "Fairly uniform," or "irregular." A slight variation in size may be expected, and if the variation does not exceed the minimum and maximum sizes specified for the count the fruit should be considered "fairly uniform." The size standards grant a tolerance of 10%. Knowing the average diameter of the fruit would greatly facilitate the determination of uniformity or irregularity, but the diameter of the fruit in inches should ordinarily not be referred to on the certificate. When fruit is tightly packed, and the numerical count is correct, it is usually properly sized, and as a rule, when there is a question of size involved, it will be in connection with slack pack. When the latter condition is found, it is of great importance to show whether it resulted from irregular sizing, or from packing fruit which is too small for the count to make a tight pack. (70)

Bulk shipment.

In most cases, citrus fruit in bulk from Florida is being sold on the basis of a minimum size specification stated in box sizes. For example, a car of oranges was recently sold with a size specification calling for nothing smaller than 288's. The receiver claimed that there was a considerable percentage of 324 size in the car, and the inspection was made to show the percentage of fruit which was less than 2 6/16 inches in diameter. It sometimes happens that the sales contract is based on the maximum size, in which case the maximum diameter should be used. For example, if a car of grapefruit is reported to contain no fruit larger than 64's, it would become the duty of the inspector to determine the percentage of fruit larger than 4 9/16 inches in diameter, which is the maximum size for 64's. The average diameter will seldom be used, although it may be of some advantage in making inspections which involve the size of fruit packed in boxes. The maximum diameter will be of value in determining whatever a lot of boxed fruit is uniformly sized or irregularly sized. No lot of boxed fruit should be reported as showing irregular sizing, unless the total of off-size fruit exceeds 10%. The total 10% may be used for either oversize or undersize, or a combination of both. No statement of box sizes will be made on certificates covering inspection of bulk fruit, and the size descriptions should be given by stating the diameter in inches and fractions thereof. (71)

(72) The minimum and maximum diameter of the various sizes in Florida and Texas citrus fruit are given in the U. S. Grades. Dismeter means the greatest diameter at right angles to a line from stem to blossom end.

(73) Tier-packed citrus in the wire-bound crate or boxes should be handled in the same manner as in standard boxes when question of size is raised.

GRADE EXPLANATION

(74) A brief statement of the requirements of each grade of the U.S. Standards for Citrus Fruits will make the discussion of quality which follows much more easily understood. It should be remembered that these standards do not apply to lemons, limes and California and Arizona citrus fruits and that destination - not shipping point - tolerances are given.

U. S. Fancy

(75) 1. Provides for a tolerance of 10%, including not more than 5% for very serious damage by any means with a further limitation of not more than 2 1/2% damage by black or unsightly discoloration. In addition, a total average of not more than 3% for decay en route or at destination.

(76) 2. In this grade the excessive discoloration (over 1/10 of the surface affected with discoloration) is scored with the other defects as there is no additional tolerance for discoloration.

(77) 3. Damage by black or unsightly discoloration should be scored separately as no individual package could exceed 5%, nor could there be more than an average of 2 1/2%.

U. S. No. 1, U.S. No.1 Bright, and U. S. No. 2 Bright.

(78) 1. Provides for a tolerance of 10% for defects, in cluding not more than 5% for very serious damage. In addition, a total average of not more than 3% for decay en route, or at destination.

(79) 2. A tolerance of 10% in addition to the above for excessive discoloration, including not more than 2 1/2% serious damage by black or unsightly discoloration, or 5% in any one package.

3. Black or unsightly discoloration is counted only against the discoloration tolerance. (80)

U. S. No. 1 Golden

1. Grade requirements are the same as U.S. No. 1, except that no more than 30%, by count, of the fruits shall have in excess of 1/3 of the surface in the aggregate affected with discoloration. It should be noted in the U.S. No. 1, Golden grade there is no minimum percentage of discoloration required in excess of 1/3 of the surface. Therefore, a lot having 10% or less in excess of 1/3 of the surface discolored may be called either U.S. No. 1 or U. S. No. 1 Golden. (81)

2. Provides for a tolerance of 10% for defects, including not more than 5% for every serious damage. In addition, a total average of not more than 3% for decay en route, or at destination. (82)

3. Damage by black or unsightly discoloration is both a defect and a discoloration but should be counted only once. It should be counted with the defects if it brings the total to more than 10%, and with the discoloration if it brings the total to more than 30%. In brief, if its addition either to other defects or to discoloration causes the lot to go out of grade it must be so counted. It should be counted as discoloration if it does not cause the lot to be thrown out of grade when added either to the other defects or to the discoloration. (83)

4. It is permissible to have individual packages showing as high as 40%, providing the average is 30% or less discoloration. (84)

U. S. No. 1 Bronze.

1. The grade requirments are the same as U.S. No. 1, except that more than 30%, but not more than 75% may show over 1/3 surface affected with discoloration, provided further that all fruit may show more than 1/3 surface affected with discoloration, provided the predominating discoloration on at least 75% of the fruit is caused by Rust Mite. In determining whether or not Rust Mite predominates, consider the intensity of the discoloration as well as area covered. (85)

2. Provides for a tolerance of 10% for defects, including not more than 5% for very serious damage. In addition, a total average of not more than 3% for decay en route or at destination. (86)

(87) 3. Damage by black or unsightly discoloration should be counted once as in the U. S. No. 1 Golden grade.

(88) 4. It is permissible to have individual packages showing as low as 21% discoloration, with others as high as 85%, providing average is between 31% and 75%, if discoloration is caused by other than Rust Mites. However, all fruit may show discoloration in excess of 1/3 the surface, providing the predominating discoloration on at least 75% or more of the fruit is caused by Rust Mite

U. S. No. 1, Russet.

(89) 1. The requirements for this grade are the same as U. S. No. 1 except that more than 75% of the fruit shall have in excess of 1/3 of the surface affected with discoloration.

(90) 2. Provides for a tolerance of 10% for defects, including not more than 5% for very serious damage. In addition, a total average of not more than 3% for decay en route or at destination.

(91) 3. Damage by black or unsightly discoloration should be scored only against the 10% tolerance for defects.

(92) 4. If no other defects of No. 1 grade, it is permissible to have 10% serious damage by black or unsightly discoloration.

(93) 5. No individual package could have less than 66% showing excessive discoloration.

(94) 6. Lot must average at least 76% excessive discoloration.

U. S. Combination.

(95) 1. Provides for a tolerance of 10% for defects causing serious damage, including not more than 5% for very serious damage. In addition, a total average of not more than 3% for decay en route or at destination.

2. In addition to the preceding tolerance, a tolerance of 10% for excessive discoloration affecting more than 2/3 the surface in the aggregrate, including not more than 2 1/2% serious damage by black or unsightly discoloration. (96)

3. Serious damage by black or unsightly discoloration should be counted only against the discoloration tolerance. (97)

4. In this grade it is permissible to have 60% of the fruit showing more than 1/3 the surface affected with discoloration, including 10% affecting more than 2/3 the surface. (98)

5. Lot or car must average at least 40% U.S. No. 1 quality. (99)

6. No individual package can have less than 30% U.S. No. 1 quality. (100)

7. No individual package may contain more than 15% defects causing serious damage. (101)

8. No individual package may have more than 5% seriously damaged by black or unsightly discoloration. (102)

9. No individual package can have more than 15% excessive discoloration (affecting more than 2/3 the surface in the aggregate). (103)

U. S. No. 2.

1. Provides for a tolerance of 10% for defects causing serious damage. In addition, a total average of not more than 3% for decay en route or at destination. (104)

2. In addition to the preceding tolerance, a tolerance of 10% for excessive discoloration (affecting more than 2/3 the surface in the aggregate). (105)

3. Serious damage by black or unsightly discoloration should be counted against the discoloration tolerance. (106)

4. There is no limit within the tolerance on serious damage by black or unsightly discoloration in this grade. In other words, the full 10% tolerance could be used for serious damage by black or unsightly discoloration. (107)

5. There is no requirment in the grade as to the minimum percentage of discoloration. In other words, it is permissible to pass lots as U. S. No. 2 without any of the fruit showing in excess of 1/3 of the surface affected with discoloration. (108)

U. S. Combination Russet.

(109) 1. Provides for a tolerance of 10% for serious damage, including not more than 5% for very serious defects. In addition, a total average of not more than 3% for decay en route or at destination.

(110) 2. In addition to the preceding tolerance a tolerance of 20% for fruit showing less than 1/3 the surface affected with discoloration. However, no individual package could show over 30% of fruit showing less than 1/3 the surface affected with discoloration.

(111) 3. Serious damage by black or unsightly discoloration should be counted against the regular tolerance for defects without limitation.

(112) 4. Lot or car must average at least 40% U.S. No. 1 quality except for discoloration, and no individual package may show less than 30% U.S. No. 1 quality except for discoloration.

(113) 5. In this grade all of the fruit may show in excess of 2/3 of the surface affected with discoloration.

U. S. No. 2, Russet.

(114) 1. Provides a tolerance of 10% for defects, including not more than 5% for very serious damage. In addition, a total average of not more than 3% for decay en route or at destination.

(115) 2. Serious damage by black or unsightly discoloration should be counted against the 10% tolerance for defects.

(116) 3. If no other defects of No. 2 grade, it is permissible to have 10% serious damage by black or unsightly discoloration.

(117) 4. Lot or car must average more than 10% excessive discoloration (more than 2/3 the surface affected in the aggregate). However, individual packages may show as low as 1% excessive discoloration, providing the lot averages more than 10% excessive discoloration.

(118) 5. All of the fruit may show excessive discoloration (more than 2/3 of the surface affected in the aggregate).

U. S. No. 3.

1. Provides a tolerance of 10% below grade require- (119)
ments, but not more than 5% for very serious defects other than dryness. (If there are no other very serious defects, a total of 10% may be allowed for very serious damage by dryness); in addition a total average of not more than 3% for decay en route or at destination

2. In this grade not more than 25% of the surface of (120)
each fruit may be of a solid dark green color.

A Summary of the Discoloration Allowed in U.S. Grades.

(The area specified for each fruit means a light (121)
shade of golden brown caused by rust mite or other means. No discoloration caused by melanose or other means may affect the appearance of the fruit to a greater extent than the shade and amount allowed for the grade.

US #1 Grade	---not more than 10% by count over 1/3 surface.
US #1 Golden	--- 0 to 30% " " " 1/3 "
US #1 Bronze	--- 31 to 75% " " " 1/3 " except if rust mite predominates then more than 75% may be discolored.
US #1 Russett	--- more than 75% by count over 1/3 surface
US #2 Grade	---not more than 10% " " " 2/3 "
US Combination	---at least 40% " " 1/3 or less, remainder up to 2/3 with 10% tolerance over 2/3 discoloration.
US Comb. Russett	---80% or more by count over 1/3 surface, remaining 20% may be less than 1/3 discolored.
US #2 Russett	---11% or more by count over 2/3 surface.
US #3 Grade	---no requirements.
US Fancy	---not over 1/10 surface.
US #1 Bright	---not more than 10% by count over 1/10 surface.
US #2 Bright	--- " " " " " " " " "

QUALITY

See Same Heading I.E.B. - Part II

Under this heading it is necessary to give a detailed (122)
description of quality. The various grades specify the minimum requirements necessary to meet the grade. Several lots, all of which may meet the grade under which they were packed, may show considerable differences in quality. The descriptions under this heading should enable the reader to accurately picture the lot. The principal factors affecting quality of citrus are listed below.

(1)	Maturity (See below)	(6)	Color
(2)	Texture	(7)	Discoloration (class)
(3)	Thickness of skin	(8)	Shape
(4)	Weight and Juciness	(9)	Juice Volume (Lemons and Limes)
(5)	Dryness (Tree origin)	(10)	Other Blemishes and Defects

(1) Maturity.

(123) Maturity of oranges and grapefruit can be determined only by the chemical analysis of the juices and the inspector is not safe in reporting maturity without a test made in conformity with standards specified in the regulations of the Green Fruit Law of the State of Origin.

(124) As a general policy no mention should be made on the certificate with reference to maturity unless there is a specific request for its determination in which case proper samples should be taken for analysis. Where the office is not equipped to make this analysis, the sample may be taken or shipped to the nearest Food and Drug Laboratory for analysis.

(125) Oranges and grapefruit after reaching a certain state of maturity, are frequently colored, either by placing the fruit in a closed room and releasing ethylene gas, or by passing the fruit through a warm solution to which a vegetable dye has been added or by a combination of the two processes.

(126) Lemons for long distance shipment are picked green or midway between green and tree ripe, and always artificially ripened. Tree ripened lemons will not carry and are sold locally.

(127) The Food and Drug Administration, under the Federal Food and Drug Act, has declared that oranges and grapefruit are adulterated if colored (inferiority being concealed) unless the juice contains soluble solids and acids in a prescribed ratio. The standard ratio for oranges is:

(128) "That oranges shall be considered as immature if the juice does not contain soluble solids equal to or in excess of eight parts to every part of the acid contained in the juice, the acidity of the juice to be calculated as citric acid without water of crystallization."

(129) Grapefruit is considered to be immature "if the juice does not contain soluble solids equal to, or in excess of, seven parts to each part of acid contained in the juice."

Each State which ships citrus fruits has set up its own standards. If the inspector desires to know the details of these standards for maturity, he should consult the proper State laws. (130)

An inspector cannot judge maturity from color alone. The Parson Brown variety grown in Florida often reaches maturity while still green in color. Navels often become well colored on the tree without reaching the 8 to 1 standard. Furthermore, fruit may be artificially colored and be immature. If the inspector should report fruit as mature solely on the basis of color, he might be furnishing a Government certificate of maturity for an illegal shipment. (131)

(2) Texture.

Texture refers to the smoothness or roughness of the skin. It is important on both oranges and grapefruit. There are five distinct classes of texture recognized in the citrus grades. The first three of these are specifically defined. The inspector should try to fix these definitions in his mind. The last two need no definition. (132)

(A) Smooth, which is required in the Fancy grade.
(B) Fairly Smooth, the minimum requirements of the No. 1 grade.
(C) Slightly Rough, (or slightly coarse), the minimum requirements of the No. 2 grade.
(D) Rough, the minimum requirement of the No. 3 grade.
(E) Seriously Lumpy, which is not permitted in any grade.

(3) Thickness of Skin.

Thickness of skin is quite closely associated with texture, and in most cases it is not necessary to make any mention of the thickness of the skin on the certificate. This is especially true when the texture and thickness of skin are comparable such as "fairly smooth texture" and "fairly thin skin." When the thickness of skin differs materially from the texture, this additional information is desirable. In determining the thickness of skin and texture, it should be realized that larger sizes cannot be expected to be as thin skinned and smooth textured as the smaller sizes. (133)

(4) Weight and Juiciness.

(134) These factors are quite closely related to thickness of skin. Heavy fruit is usually thin skinned and juicy. It is not absolutely necessary that these two factors be reported on market certificates, but they do furnish additional information which at times may be desired by some dealers. The following descriptive terms may be used: For weight - "heavy," "fairly heavy," and "light"; for juiciness - "juicy," and "fairly juicy."

(5) Granulation (Tree Dryness).

(135) The dryness resulting from freezing on the tree is discussed under the Condition heading. Dryness may occur, however, when there has been no freezing, and is then to be regarded either as a varietal peculiarity, or the result of the conditions under which the fruit was grown. This kind of dryness is known as granulation. Valencia oranges harvested late in the season, or from young trees even in early or midseason especially after a drought, are quite likely to show it, particularly in the large sizes. Thompson Navel oranges may show granulation no matter when they are harvested. In both these varieties the granulated condition sometimes appears throughout all of the pulp of affected fruits, but more often only in the upper or stem-end portion. Even in fruits showing the latter condition, the granulation if seen in cross section affects all of the pulp and not merely small spots in two or three segments, as so often happens in freezing injury.

(136) In tree-frozen fruit the juice sacs in the affected portions collapse, wither, and separate from each other and from the segment walls. The fruit feels light in weight.

(137) In granulated fruit the juice sacs do not separate from each other or from the segment walls; they also remain turgid, the juice being displaced by solid matter, which is yellow to grayish-white in color. Such fruit feels firm, but is light in weight.

(138) During periods when no frost damage has been reported in the shipping sections, the inspector encounters fruit which feels abnormally light, he should put aside all such specimens for cutting. If the suspected specimens cut dry enough to affect the grade in question, they should be scored with the other grade defects.

Frequently Florida fruit has shown a large percentage of tree dryness in the large sizes, and none in the smaller sizes. In such cases dryness should be reported according to sizes or by stating the percentage in the large sizes and giving the sizes which show no dryness. This may result in reporting certain sizes below grade on account of dryness. In such cases no attempt should be made to state the grade of the entire car. A simple statement that certain sizes are below grade and other sizes up to grade will be sufficient. (139)

If the dryness is such that it cannot be determined with any degree of accuracy by weight of the fruit, a blind sample of 5 to 10 oranges should be taken from each box examined and cut and the percentage should be based on this sample. Thus: "Of samples cut from 20 to 40%, averaging approximately 35%, showing dryness affecting more than 1/4 inch, mostly 1/2 to 3/4 inch of the stem ends of all segments." (140)

For Freezing Dryness see Condition heading. (141)

(6) Color.

In reporting color the inspector should bear in mind that true color refers to the degree of yellow or orange color and not to discoloration caused by rust mite, Melanose, and other blemishes. A lot may be classified as russets, and still be certified as well colored. In other words, well colored in russets would be the same as well colored in brights. (142)

The following terms should be used to describe the degree of color:

"Well Colored" means that the fruit shows practically no trace of green color. (143)

"Fairly Well Colored" means that except for one inch in the aggregate of green color the yellow or orange color predominates over the green color on that part of the fruit which is not discolored, except that for lemons at least 2/3 of surface shows yellow color. (144)

"Slightly Colored" means that except for two inches in the aggregate of green color the portion of the fruit surface which is not discolored shows some yellow or orange color. (145)

(146) In the certification of limes the color should be described as "good green," "turning," "yellow," or a combination of these terms, and reported under the condition heading on the certificate, It is always desirable to show the percentage of turning or yellow limes.

(147) Certificate Steatments Relative to Color Added Fruit: Color added processes are not sufficiently standardized to warrant any mention on the certificate of the degree of color attained. Therefore, no attempt should be made to describe color more than is done with uncolored fruit, but it should be mentioned under Products Inspected that the fruit is stamped "Color Added."

(7) Discoloration and Class.

(148) The U.S. Citrus Standards, other than Limes, Lemons, and California and Arizona Citrus, provide for an additional classification for discoloration. The term "Excessive discoloration" should be used to describe discoloration when in excess of the amount permitted in the grade or class. The use of this term is advisable because a fruit may be scored against the Bright Classification due to the kind or intensity of the discoloration, and yet not be in excess of 1/10th the surface. This also applies to the No. 1 grade. Also light smooth scars which do not cover more than 1/4th the surface may affect the appearance more than 1/3rd the surface of light golden brown discoloration, but yet be scored as excessive discoloration.

(149) When the boxes are stamped either "Bright," "Golden," "Bronze," or "Russet," the shipper has specified that in addition to grade the fruit is of a certain class, thereby indicating the degree of discoloration it shows. Discoloration, however, also has a bearing on grade, and in order to show this, it is necessary to report defects of grade and excessive discoloration separately, except in the Fancy grade when the lot is put out of grade account discoloration. If a lot shows 5% grade defects such as scab, ammoniation, etc., and in addition 25% shows excessive discoloration, it should be shown that its failure to meet grade is due to excessive discoloration, e.g., "Stock fails to grade U.S. No. 1 account discoloration in excess of tolerance."

(8) Shape.

(150) Shape should be reported in conformity with the various grades. In connection with these grades, the following terms should be used on the certificates:

"Well Formed": This term will meet the require- (151)
ments in the U. S. Fancy and U.S. No. 1 in all grades.

"Fairly well Formed": This term will meet the (152)
requirements of U.S. No.1 in the Lemon and Lime Standards, and U.S. No. 2 in all other standards.

"Slightly Misshapen": This term will meet the re- (153)
quirements in all U.S. No. 2 grades.

"Misshapen": This term will meet the requirements (154)
of all U.S. No. 3 grades, and also the requirements of the U.S. No. 2 Lemon and Lime grade.

"Badly Deformed": This term will meet the require- (155)
ments of the U.S. No. 3 Lemon grade.

"Seriously Deformed": This term fails to meet the (156)
requirements of U.S. No. 3 in any grade.

(9) Juice Content of Lemons and Limes.

The juice content of both lemons and limes is based (157)
on volume. In determining thevolume per cent, the following equipment is necessary:

Galvanized iron tank with overflow spout.
Galvanized iron cage with hinged lid and cover.
Graduated glass cylinder, 1000 cc.
Supply of cheesecloth.
Juice extractor.

Procedure in Determining Juice Content.

Sampling.

Use 1 dozen or more fruits when possible. Of (158)
the larger size fruits, a sufficient number should be taken to fill the wire cage. As the juice content is intended to be the average for the lot, the samples shall be taken at random by sizes. Sized fruits or fruits of near the same size should be selected for samples.

Lemons or limes should be tested as soon as possible (159)
after the sample has been secured because of their susceptibility to rapid drying of the rind which will cause a change in the percentage of juice content.

Measurement of Volume of Fruit.

(160) (1) Stand tank on level surface convenient to water supply and a sink.

(161) (2) Fill tank with water to overflow level.

(162) (3) When overflow drip has practically ceased, place graduated cylinder in position under overflow spout, lower empty cage to bottom of tank, measure the volume in cubic centimeters (cc) by the water displaced.

(This need not be done for each determination if this figure is recorded. It should be checked occasionally.)

(163) (4) Refill tank (cage removed) to overflow level.

(164) (5) Place fruit sample in cage and lower carefully into water receiving overflow into the empty graduate. Stop the spout with the thumb while the first 1000 cc. quantity of displaced water is emptied from the graduate and proceed.

(165) (6) Subtract cage volume (3) from total volume, (5) to obtain volume of fruit sample.

Extraction of Juice.

(166) (1) Cut fruits in half.

(167) (2) Ream on either a hand reamer or one of the motor-driven types.

(168) (3) Strain juice through double thickness of dry cheesecloth and squeeze the pulp as dry as possible.

(169) (4) Measure volume of juice in the 1000 cc. graduate.

Calculation of Per Cent Juice.

(170) $\frac{\text{Volume of Juice} \times 100}{\text{Volume of fruit.}}$ = per cent juice by volume

It is not necessary to make the juice content determination unless specifically requested by the applicant or the inspector believes there is doubt regarding whether the lot meets the minimum juice content required in the grades. When the juice content has not been determined, the following statement should be made under "Remarks": "Per cent of juice content not determined, but lemons (or limes) apparently meet the juice requirements of the grade." (171)

The inspector should not attempt to show the juice content by the volume per cent on the certificate. When the volume per cent meets the minimum requirements of the grade, certify the grade without any reference to the juice content. Thus: "U. S. No. 1." However, if the volume per cent is below the minimum requirements of the grade the grade certification should show this fact. Thus: "Fails to grade U.S. No. 1 account juice content is less than _____% by volume." (172)

(10) Other Grade Defects.

The term "Grade defects" as used on the certificate will be used on the certificate to report all blemishes that are serious enough to affect grade while the term "blemish" should be used in reporting minor injuries not serious enough to affect the grade. However, the general policy as outlined in I.H.B. - Part II should be followed with reference to reporting minor factors which are not serious enough to affect grade. On the other hand, if the applicant insists on showing factors on the certificate not serious enough to affect grade, the reason should be shown under Remarks. Thus: "Factors not affecting grade shown on certificate at specific request of applicant." (173)

Ammoniation Exanthema.

Ammoniation is a non-parasitic disease of the fruit, leaves, and twigs of oranges, grapefruit, limes, and lemons. It occurs in California, Texas, the Isle of Pines, Puerto Rico, and Florida, but is most common, and most serious on oranges in Florida. The first stage on both grapefruit and oranges consists of brown gum-pockets in the oil glands of the peel. On oranges the affected spots become elevated so that they appear as pimples, or as large irregular scars. The pimples vary from about 1.32nd to 1/8th inch in diameter, and are sometimes found so close together that they almost touch over the fruit surface. There are two types of scars: One rough and dark reddish-brown like the pimples; the other fairly smooth and dull grayish-brown to almost black. The rough scars are often very deeply cracked, whereas the smoother ones rarely show more than a superficial checking. (174)

(175) Both kinds of scars occur as spots about 1/4 to 1/2 inch in diameter or as irregular bands or streaks which may be so large as to almost encircle the fruit. In both of these the peel is rather hard and stiff and as a result often becomes cracked.

(176) The pimple stage of Ammoniation is sometimes mistaken for Melanose. The two can be distinguished by the fact that Melanose pimples are dark brown surrounded by gray and there is a definite line of demarcation between them and the healthy peel around them; those of Ammoniation are dark reddish-brown and if cracked at all have cracks across the top.

(177) On grapefruit Ammoniation occurs most often as gum-pockets in the white portion (albedo) of the peel. These are of various sizes, but are unually larger than those in oranges, and can often be detected by a slight elevation or bump in the peel that overlies them. In grapefruit they are most common at or near the ends. Gum-pockets in the peel of grapefruit may also result from Meely-Bug injury. In this case, however, there is a brown streak (the mark of the puncture made by the bug) extending from the gum-pocket to the surface of the fruit.

(178) The cause of Ammoniation is not known. The condition is found most commonly, however, where there is poor drainage, and where the soil is underlaid by hardpan, is subject to irregular moisture condition, or has been given excessive cultivation. It is also found on trees that are oversupplied with organic nitrogen. Late findings indicate that a deficiency of copper or of boron in the soil may be a contributing factor. Badly Ammoniated oranges are especially subject to attack by Blue or Green Mold Rots.

Buckskin (Rust Mite Russeting Caused by the Rust Mite, Phyllocoptes Oleivorus).

(179) The Rust Mite occurs in the Gulf States and the West Indies, and to a slight extent in California, but it is not a serious pest of citrus fruit anywhere in that State. Although it may attack all commercial varieties of citrus, most of the damage is done on grapefruit and oranges.

(180) The Mite is a minute spider which sucks the oil from both leaves and fruit, and thereby injures them so that they fail to develop normally. Several types of degrees of the injury are recognized:

1. Injury produced by early infestation. This is characterized by slight etching or russeting of the peel near the stylar end of the fruit. It is sometimes mistaken for the effect of rubbing while the fruit is on the tree or during the packing process. (181)

2. Injury caused by somewhat later but severe infestation and known as Buckskin. Fruits affected by this blemish are roughened, and have a pale grayish or silvery appearance. The rind becomes abnormally thick. Young fruits are often stunted in growth; fruits of normal size are commonly light in weight and contain less than the usual amount of juice. Buckskin is much lighter in color than Melanose. The blemish is found chiefly on grapefruit, occasionally on lemons and limes. It does not spread in transit, but the damage done by it to the market value of the fruit is considerable. Fruit showing Buckskin may be placed in a lower grade or classification solely because of this blemish. Buckskin is less common on oranges, but the degree and period of infestation that produce it on grapefruit cause the so-called black russet condition on oranges. (182)

3. Injury caused by the common summer infestation. In this type the russeting usually occurs in solid though poorly defined areas or patches that may involve most of the surface of the fruit. It is also found in streaks about 1/8th to 1/4th of an inch wide, occurring either alone or as extensions toward the blossom end from a larger russet area on the top or side of the fruit. These streaks, known as Rust-mite tear staining, were at one time thought to be caused by the Anthracnose fungus, but so far as Florida conditions are concerned, are now known to be merely one form of Rust-mite injury (for other forms see sections on Anthracnose and Melanose). Tear staining of lemons in California is caused by the Anthracnose fungus (Collectotrichum). (183)

4. Injury by late fall or winter infestation. This is usually so slight that it produces merely the so-called golden or bronze effect that prevents the fruit from being classed as "bright." (184)

Creasing.

(185) Creasing is a condition found in mature and over-mature fruits and is characterized by narrow sunken furrows or grooves in the peel, usually less than 1/4 inch wide, and from 1/2 to 2 inches long. These may extend both longitudinally and crosswise and in severe cases may run together to produce large areas of bumpy peel. In small creases the color of the sunken skin is normal, but in larger ones it may be yellowish-green to gray. On fruits that have been subjected to hot solutions such as those often used in the "color added" treatment, creases become more apparent, the sunken peel often becoming watersoaked or cracked. Sinking of the peel in the creases is due to weakness in the underlying spongy portion. If a thin paring is made so that the tissue bearing the oil cells and yellow color is removed from the crease, it can be seen that the albedo is thin, or cracked and pulled apart.

(186) In California oranges mild creasing is not considered a serious defect because the peel is pliable and few of the fruits crack open from pressure during packing and shipping. Florida fruit, however, has a more brittle peel so that creased areas split easily in tight packs and open the way for Blue and Green Mold Rot. The cause of creasing is not known. Except in fruit subjected to hot solutions, very little, if any, increase in amount or severity of creasing has been observed in transit.

(187) Creasing will be handled as a quality factor and reported under the Quality heading on the certificate except on color added fruit. On fruit marked "Color Added" all creasing should be reported under the Condition heading on the certificate, and treated as a condition factor.

Internal Decline (endoxerosis).

(188) This trouble is often serious in California lemons. As the name implies, it is due to an internal drying and breakdown of the tissues at or near the stylar or "nipple" end of the fruit. Externally the affected fruits may appear normal, but frequently lack of luster or over-development of orange-yellow color at the stylar end may indicate the presence of the disease. In other instances, a breakdown of the internal tissues beneath one side of the nipple may result in a depression that causes the nipple to bend over to one side, and so present one characteristic of the disease.

On cutting across the nipple end of diseased fruits, it will be found that the white portion of the peel often shows pinkish-brown to brown areas and sometimes gummy masses of broken down tissues. In advanced stages the central pithy core and the fleshy pulp tissues at the stylar end of the fruit become pinkish to russet brown. (189)

Internal Decline does not appreciably increase or develop after the fruit is packed, consequently this trouble should be considered a grade factor on the receiving market. (190)

Puffiness.

Puffiness in citrus fruits is a condition in which the peel becomes separated from the segments beneath so that it stands away from them and is loose. Affected fruits lose their natural shape in tight packs and the loose peel cracks thus affording easy entrance for the organisms causing Blue and Green Mold Rots. (191)

Puffiness is found on mature and overmature fruit. In California oranges it is often associated with creasing, though fruits from both California and Florida may be puffy without being creased. The trouble is most prominent in varieties of the Mandarin group of oranges, particularly tangerines. (192)

Puffiness should be reported under the Quality heading and counted against grade. (193)

Melanose Caused by the Fungus Phomopsis Citri Which Also Causes Stem End Rot.

Melanose occurs in Florida, Texas, and the West Indies on leaves, young twigs, and fruit of all species of citrus. It can be recognized on the fruit as small, brown, raised spots which are produced by the fungus attacking and killing a few epidermal cells on the rind. In these spots it usually dies long before the fruit matures. In most cases the individual spots are about the size of a pinhead, although they may coalesce to form rather large scab-like patches known as Mudcake Melanose. Sometimes they appear in a kind of tear-staining, but can readily be distinguished from the blemish of this name caused by Rust Mites, by their brown, glazed appearance, and the fact that they are slightly elevated above the surface of the surrounding healthy skin. Melanose tear-staining is much more common than that caused by Rust Mites. (194)

(195) Melanose does not spread in transit. It is of importance merely as a blemish, and its chief effect is to cause the fruit to grade lower account discoloration or affect on texture than it would if no Melanose were present.

Thorn Injury.

(196) Injuries due to thorn punctures are often found on citrus fruits from all growing sections. When deep and well marked, they are easily recognized, but when shallow, they may appear as little more than russetted areas.

(197) Infection through these injuries is not common but when deep they may afford easy entrance for Blue Mold and Stem End Rot fungi.

Tear Staining.

(198) Tear staining or streaking may be due to several different causes, but it due chiefly to (1) the Melanose, (2) Rust Mites, or, rarely, (3) the Anthracnose fungus. Melanose tear staining is caused by the Melanose fungus (Phomopsis citri) and occurs in the form of streaks where water from rain or dew has run down over the side of the fruit, carrying spores of the fungus with it, and resulting eventually in infection and the development of the typical pimples in the peel. It is much more common than that caused by Rust Mites.

(199) Rust-Mite tear staining occurs as brown streaks on the fruit, the discoloration occurring solidly rather than as numerous small discolored spots as in Melanose tear stain. The surface of the peel in Rust-Mite tear staining is fairly smooth, whereas in the Melanose form it is likely to be somewhat rough.

(200) In California a staining or streaking similar to that caused by Rust Mites may be brought about by a light frost followed by sunshine, the injury probably being caused by oil liberated from the rind, which causes streaks of discoloration of the peel as it runs down over the side of the fruit.

(201) Tear staining of lemons caused by the Anthracnose fungus (Colléctotrichum) is known to occur in California, but is of relatively little importance. Anthracnose tear staining is rare in Florida and as observed, there it is indistinguishable from the staining caused by Rust Mite.

Sunburn.

(202) There are sometimes seen on citrus fruits large areas which are pitted, hard, and much yellower than the rest of the fruit surface. The pits are small and apparently have resulted from collapse of the oil cells. In the lots of fruit which show this condition, it is usually possible to find other fruits which show various degrees of more severe injury, the stages most often seen being as follows: (1) yellow hard spots, (2) the same with a brown patch near the center, (3) the same with a gray patch at the center surrounded by a brown zone, (4) the same with the gray patch (one-fourth to one-half inch in diameter) showing either very small black specks (the fruiting bodies of some fungus), or a black velvety fungus growth over the whole surface, (5) the same with the gray area softened and in many instances encircled by a brown to dull salmon colored diseased zone, (6) large, softened areas which are a dull salmon color all over and are surrounded by a hard, yellow, pitted zone.

(203) The occurrence of spotting which can be arranged in such a series is probably due (1) to injury by hot sunshine acting alone or in combination with drops of films or spray mixture adhering to the fruits; (2) to subsequent infection by one or other of the two Stem-End Rot fungi (Phomopsis and Diplodia) or by the fungus which caused Anthracnose (Colletotrichum).

(204) Sometimes in late summer or early fall severe sunburn develops on tangerines after a hard freeze, or after drouths that cause defoliation. These severe burns are similar to severe sunburn of other citrus, are easily culled out, and rarely reach the market. The lightly sunburned fruit is difficult to detect after the fruit colors on the tree. In most cases, however, the injured cheek is paler than normal since it fails to develop the full normal, deep orange-red color. The affected peel is thicker than that of unaffected areas, and the juice sacs in the segments beneath are collapsed and shriveled quite like those found in tissues injured by freezing. In very mild cases only a part of one segment may be affected; in severe cases several or all may be affected.

Smudged-Smutted.

(205) The term smudged is applied to fruit more or less covered with a smoky deposit which cannot be rubbed off. This is caused largely from smoke by orchard heaters during the seasons when frost has threatened.

(206) The term smutted should be used when a black, sooty deposit which can be rather easily scraped off is found around the stem end of the fruit. It is fungus growth, developing on excretions from Black Scale in California or White Fly in Florida. This defect should be classed as discoloration and not as dirt when very light and reported as a defect when the fruit has a dirty appearance.

(207) These blemishes should be reported only when found in such quantity as to affect the value of the fruit for market and should be scored in accordance with the proper application of the grade.

Scarring.

(208) All citrus fruits are subject to scarring which aside from that caused by "Thrips" or some condition specifically noted below, is caused for the most part by mechanical injuries such as scratching, and limb rubs while the fruit is still growing on the tree. With California fruit particularly, the amount of scarring is the most common factor in determining grade.

(209) Rubbing scars are caused while the fruit is growing. They may be smooth, affecting the shape and texture only slightly, or in severe cases they may materially affect both the shape and the texture.

(210) Scarring should not ordinarily be reported except that portion of it which is excessive for the grade or brand in which it is found. The inspector can usually learn from the shipper's agent what grade any particular brand is supposed to represent, if it is not evident from the manifest or from his examination of the brands in the car. Study of the application of the grade rules to a few actual shipments should make the inspector reasonably accurate in his judgment.

Scab (Caused by Sphaceloma Citri).

Scab is found chiefly on grapefruit. It attacks (211)
tangerines to a lesser degree, and is sometimes found affecting Temple and King oranges, Persian limes, and some tangelos, but is extremely rare on sweet oranges. Late bloom Temples are almost always culls because of Scab. The disease occurs on fruit from Florida, Texas, Puerto Rico, and Cuba, but has not been reported from California. The first symptons are small, raised areas in the peel, which are whitish at first, but which later assume a pinkish or tan color. These protuberances may be single or they may coalesce to form large raised patches of gray or tan colored Scab. Scab affects only the peel, making the fruit unsightly and therefore, less valuable on the market. Since infection takes place only when the fruit is small, there is no danger that new infection will occur in transit or in storage.

Purple Scale.

The most common scale found on citrus fruit is the (212)
Purple Scale, which has a gray covering that is roughly the shape of an oyster shell. These may occur anywhere on the fruit, but tend to collect at the circle where two fruits are in contact on the tree. Brushes used in the packing houses in washing and polishing will in many cases remove light infestations of this scale if it has been dead for a long time, but will have very little effect on fruit heavily coated with living scale.

Red Scale.

Red Scale is circular, dark reddish-brown, with a con- (213)
spicuous nipple-shaped light-brown center and is about 1/12 inch in diameter when full grown.

Thrips Injury (Caused by a Minute Insect - the Citrus Thrips, Scirto-Thrips Citri, in California, and the Florida Flower Thrips, Frankliniella Tritici Bispinosus, in Florida).

The damage done by Thrips to citrus trees and fruit is (214)
caused by the feeding of both adults and larvae upon the surface of the parts attacked. Feeding may be done on both young and nearly mature fruit, and on new and tender foliage.

(215) In California and Arizona Thrips injury in its most characteristic form occurs as a roughened gray band or ring at the stem-end. Occasionally more or less irregular and indefinite roughened areas occur on other parts of the fruit. Naval oranges are more frequently affected than Valencias. Grapefruit, lemons, and tangerines are also attacked.

(216) True Thrips injury is rare on Florida citrus fruit, and probably seldom occurs on fruit from that State examined by market inspectors. The blemish commonly called Thrips injury on Flordia fruit is now believed to be merely the result of wind chafing during the late winter or early spring while the fruit is young and small. It has been found, for example, that when an orange tree was screened against wind, the so-called Thrips injury did not develop; and, conversely, that on trees not so protected it did develop. Thrips were present in large numbers on both the screened and unscreened trees.

(217) Thrips marks on California fruit may be fairly smooth, affecting the shape and texture only slightly, or in severe cases they may affect both the shape and texture.

(218) Injury caused by Thrips as related to grade should be treated the same as scarring due to other causes.

Reporting Defects of Combination Grade.

(219) To promote uniformity between shipping point and terminal market inspection, and to avoid conflicting percentages of defects, it will be the policy to report defects within tolerance when the product meets the specification of the Combination grade. Example: "Defects within tolerance," or "Defects average within tolerance." It the car or lot fails to meet the grade, naturally it will be necessary to show the percentage of defects the same as when a lot fails to meet the No. 1 grade.

(220) The expression "Grade defects within tolerance" will naturally be assumed to refer to whichever grade is shown under the heading of Grade.

Examples Quality Statements.

(221) 1. Clean, well formed, generally well colored, few fairly well colored, mostly fairly smooth texture, some smooth texture. Grade defects within tolerance.

2. Clean, fairly well to well formed, fairly well to well colored, mostly fairly smooth texture, some slightly coarse texture. Grade defects range 5 to 25%, averaging approximately 15%, consisting mostly of severe creasing and Ammoniation, some severe scars. (222)

3. Clean, well formed, well colored, and fairly smooth texture. Of samples cut from 20 to 40%, average approximately 30%, damaged by dryness affecting from 1/4 to 3/4 inch, mostly 1/2 to 3/4 inch at stem end. Other grade defects within tolerance. (223)

4. Clean, well formed, well colored and fairly smooth texture. In 100 to 150 sizes inclusive, from 10 to 20%, average 15% damaged by dryness occurring at stem end affecting 1/4 to 3/4, mostly 3/8 to 1/2 inch. Other grade defects within tolerance. (224)

5. Clean, fairly well formed to slightly misshapen, fairly well to slightly colored and fairly smooth to slightly coarse texture. Of samples cut from 5 to 40%, average approximately 25%, seriously damaged by dryness, including 15% affecting 3/4 inch at stem end. Other grade defects within tolerance. (225)

6. Clean, mostly well formed, many slightly misshapen, mostly well colored, many fairly well to slightly colored, and fairly smooth to slightly coarse texture. Excessive discoloration range 10 to 40%, average approximately 30%. Grade defects within tolerance. (U.S. No. 1 Golden). (226)

CONDITION

See Same Heading I.H.B. - Part II.

Firmness

Firmness should be reported under the Condition heading in conformity with the various U. S. grades. Each inspector should become familiar with the terms as used in these grades before making an inspection, and use the proper term for the grade in question. The following terms should be used in describing firmness: (227)

A. "Firm." Fruit must be "Firm" to meet the requirements of the U. S. Fancy and the U.S. No. 1 grade in all Standards. (228)

(229) B. "Fairly Firm." Fruit must be "Fairly Firm" to meet the requirements of the U.S. No. 2 in all Standards.

(230) C. "Slightly Soft." Fruit may be "Slightly Soft" and still meet the requirements of U.S. No. 3 in all grades and also the U.S. No. 2 in the lemon grade.

(231) D. "Soft." Fruit may be "Soft" and still meet the requirements of U.S. No. 3 in the Lemon Standards, but fails to meet the requirements of No. 3 in the other Standards.

(232) E. "Spongy." This term should be used to describe fruit that is seriously spongy.

(233) It should be remembered that fruit may feel soft due to thinness of the skin and yet be properly described as firm.

The following factors should be reported under this heading when present:

(234) (1) Freezing injury or dryness associated with freezing injury.

(235) (2) Creasing on color-added fruit.

(236) (3) Sprouted Seeds (Grapefruit).

(237) (4) Skin injuries.

(238) (5) Stem buttons attached or missing when specifically requested to show this factor.

(239) (6) Decay.

Freezing Injury - Transit Freezing - Freezing on the Tree.

(240) Investigations by the Bureau of Plant Industry indicate that Washington Navel oranges freeze at 26° to 28° F., Thompson Navel a little higher, Valencia at 26.5° to 28.3°, and lemons at 27.7° to 29.5°.

Transit Freezing.

Freezing in transit seldom shows the drying out so characteristic of fruit frozen on the trees. It should also be remembered that if the freezing occurred in transit, injury is most likely to occur next to the side walls and the floor of the car, rather than in the body of the load. When the fruit does not show ice on cutting, the inspector will have to depend on other symptons for his determination. Oranges that have been frozen are often bitter in flavor for a time after thawing, but this is not a consistent factor. If the freezing has been severe, the peel may show discoloration ranging in severity from a brown stain to leaden-gray discolored areas of varying size, which greatly resemble watery breakdown (see section on watery breakdown). The affected rind tissues may or may not be sunken, but when severly frozen, they usually become soft and mushy and are underlaid by mushy pulp tissue. (241)

The inspector should learn to look for freezing damage by cutting off both ends of an orange, then cutting through the rind of the central portion remaining and pulling the segments apart. If the fruit has been frozen the membrane between the segments will show a soaked condition, and frequently a number of white specks, which are Hesperidin Crystals, resulting from the freezing. However, the presence of Hesperidin Crystals in citrus fruit is not necessarily an indication that the fruit has been frozen. They also may result from the application of heat to the fruit or from rapid drying out of the tissues. Freezing damage may be confined to a part of an individual fruit, in which case the signs suggested will be found only in the affected part. (242)

The method of examination described above is particularly useful for California oranges. Florida oranges are not so easily examined in this way but are most likely to show the mushy condition in cross section. (243)

Lemons and grapefruit show the damage in cross section much more plainly than oranges, although it is desirable at times to pull grapefruit sections apart as recommended above for oranges. If lemons have been seriously damaged, the pulp becomes mushy at once after thawing. (244)

(245) Grapefruit shows, in addition to the symptoms just described, a milky appearance of the pulp which is in marked contrast to the very light amber color and the almost transparent condition of unfrozen pulp. The contrast is especially noticeable in fruits that have been frozen in small spots or only on one side. The milky appearance of the pulp is also found in grapefruit that has been in storage for 8 to 10 weeks, and may be accompanied by a bitter taste. However, such fruit is not mushy and watery like that which has been frozen.

Fruit Frozen on the Tree.

(246) Citrus fruit frozen on the tree shows a number of the symptoms described under transit freezing, if examined soon after the freezing occurs. After a few days, however, additional symptoms appear. First and most characteristic among these is a buckling of the partition walls at the stem end of the fruit, with or without drying of the pulp. Small pits or pitted areas may also develop in the peel on any part of the fruit.

(247) In tree frozen fruit which stays on the tree long enough so that some drying occurs, freezing is manifested on the market by woodiness of the pulp or by open spaces between segments due to the collapse and drying out of some of the juice sacs. There are, of course, all degrees of dryness from very slight to total; in the practical handling of citrus fruit three degrees are recognized:

(248) (1) Slightly open: when the cut surface shows slight open spaces between the segment walls and the juice sacs, but the surface of the pulp appears juicy.

(249) (2) Distinctly open: when the cut surface shows large open spaces, but the pulp still appears juicy.

(250) (3) Dry: when the cut surface shows no large open spaces, but the fruit seems to have dried out evenly all through, and the color of the pulp shows it to be almost devoid of juice; or when the fruit has dried out with some of the segments more or less collapsed. The first condition just described is sometimes referred to as "shredded wheat."

Drying in oranges usually progresses from the stem end, (251) whereas in grapefruit it may proceed form either or both ends, or it may begin around the outside of the pulp. Drying is not found at the center of the fruit except in extreme cases. If citrus fruit that has been frozen is examined a few days after it thaws, it will usually show the Hesperidin Crystals, already mentioned, on the membrane or "rag" which separates the segments of the pulp. On the other hand, the crystals are sometimes visible when examination is made within a few hours after the freezing occurred, whereas if it is not made until several weeks afterward, they may not appear at all. In frozen tangerines the crystals may occur in the pulp as well as on the membrane between the segments. When tree-frozen fruit that has remained on the tree for several weeks after freezing is examined on the market, it is found to have a peel that is thicker than normal.

All transit freezing injury should be reported under the (252) Condition heading, and handled as a condition factor.

Tree freezing injury and dryness associated with tree (253) freezing should be reported under the Condition heading on the certificate. It will be counted against grade after it is believed that partically no additional changes will take place in transit. General instructions with reference to freezing injury and dryness will be issued in the Division Letter from time to time following field freezing. When there are no specific instructions issued in the Division Letter, the inspector should treat dryness as a factor of condition unless it is the equivalent of more than 1/4 inch in excess of what the grade permits, in which case it should be counted against grade.

Creasing in Color Added Fruit.

While there is no experimental evidence to show to what (254) extent, creasing will increase in transit, a number of cars inspected at shipping point and at destination indicated rather definitely that marked changes may take place in creasing in lots which have received the color added treatment. Creasing in color added fruit should, therefore, be reported under the Condition heading on the certificate, and counted against the condition.

Creasing on fruit not color added should be counted (255) against the grade and reported as a Grade defect. - See Quality heading.

Sprouted Seeds (Grapefruit).

(256) In the latter part of the grapefruit season, beginning sometime in March, inspectors should cut specimens through the middle in order to look for sprouted seeds, which should be treated like any other factor of condition. The following are the limits which should be permitted in the various grades:

U.S. No. 1 - Not more than 6 sprouts averaging over 1/4 inch.
U.S. No. 2 - Not more than 6 sprouts averaging over 1/2 inch.
U.S. No. 3 - Not more than 6 sprouts averaging over 3/4 inch.
Any fruit with a sprout reaching the rind is a Cull.

(257) When a lot shows more than the limit it should be reported as "Now fails to grade, etc."

(258) In determining the percentage of fruit affected with sprouted seeds, the inspector should be guided by the instructions given for determining the percentage of dryness.

Skin Injuries.

Skin Breakdown.

(259) Citrus fruit - particularly oranges from Florida - frequently show drying out, darkening or sinking of the oil vesicles near the stem end and at times on other parts of the skin. These injuries may be due to aging, heat injury, storage breakdown, or gas or washing injury. It will at times be impossible for inspectors to determine the exact cause of these injuries, and in order to standardize the method of reporting such defects on the certificate the term "skin breakdown" will be used to describe the various conditions mentioned above. Skin breakdown should be described on the certificate under the Condition heading. In most cases it will be desirable to show the extent of the injury and its location, which will usually be around the stem end of the fruit. In describing the degree of this injury on the fruit the following terms should be used: "slight ...." when not sufficient to affect U.S. No. 1; "damage by ...." when bad enough to score against U.S. No. 1; "serious damage by ..." when bad enough to score against U.S. No. 2; "very serious damage by ...." when bad enough to score against U.S. No. 3.

Scattered spots of this breakdown, which are usually about one-fourth inch in diameter, may be found on any part of the fruit. The term "pitting" should be used in describing this type of injury. The term "pox" should be retained for the depressed spots frequently found on grapefruit which has been held for some time in storage. In making Condition only inspection, it is not necessary to show whether skin breakdown affects grade, but the severity should be shown thus: "Range from 1 to 15%, average approximately 8% slight to severe, mostly slight, skin breakdown occurring mostly at stem end of fruit."

The following paragraphs on Aging, Heat Injury, Pitting, and Brown Stain are included in this Handbook for the information of inspectors. As stated above, however, these terms should not be used on the certificate, all such injuries being described by the general term "skin breakdown." (260)

Aging:

The term aging is used in referring to the condition sometimes found on citrus fruit, chiefly grapefruit and oranges, in which the peel around the stem buttons or elsewhere on the upper part of the fruit becomes wilted and shriveled, with or without accompanying collapse of outer rind tissues. This condition is apparently caused by loss of water from the fruit, and is frequently accompanied by a browning of the affected areas. Browning, however, may also be caused by improper conditions in the coloring room, or by the use of heated solutions in washing the fruit, or in the "color-added" process. Fruits showing extreme symptoms of aging, accompanied by browning, usually have "off" or aged flavor. (261)

Heat Injury.

Citrus fruits are sometimes injured by heated washing solutions, or by heated dye solutions used in the "color-added" process. The injury may occur as a brown band around the stem, as isolated brown patches or streaks elsewhere on the fruit, or as a general browning of most or all of the surface of the fruit. The affected area is slightly sunken, and the outer part of the peel frequently has a collapsed or dried-out appearance. In most instances the fruit is softer at places where the injury occurs than at places where the peel seems normal. (262)

There is some evidence that heat injury becomes accentuated as time elapses, following exposure of the fruit to the heated solution. Consequently, on a given lot of fruit it may be more noticeable on the market than at shipping point. (263)

(264) If injury on the types described is found at shipping point, or on fruit just arrived on the market, it can safely be called heat injury, the presence of the "color-added" stamp on such fruit being additional evidence that the injury was caused by heat. If found on fruit from cold storage, it should be called skin breakdown.

(265) The band type of injury is often called "burnt stems" by the trade, but this term should not be used on the certificate.

Pitting

(266) Pitting, as its name indicates, consists of abruptly sunken spots in the peel. It is sometimes called pox, but the use of this term is undesirable. The spots are not discolored at first, but later they may become slightly pink on grapefruit and eventually brown on both grapefruit and oranges. They vary in diameter from 1/4 inch, where they occur singly, to 1-1/2 to 2 inches or more where several pits coalesce. They are usually larger on grapefruit than on oranges. Softening often occurs underneath the pits, which may be invaded by Blue Mold or the Stem End Rot fungus. The pulp beneath large pits or pitted areas usually has a tainted taste. In affected areas of the rind the oil glands are particularly noticeable, since in such places they are slightly darker than in the tissues surrounding them. In old pits these glands are definitely sunken.

(267) The disease may occur on fruit at time of packing, particularly on pineapple oranges, but generally does not develop until after a storage period of 4 to 6 weeks, when it is often accompanied by aging. It usually is worse at 36° to 40° F. than at either higher or lower temperature. It sometimes develops in transit, especially on smooth thin-skinned oranges.

Brown Stain (Scald).

(268) The terms Brown Stain and Scald have been used to refer to what is apparently the same disease, namely a superficial and fairly uniform browning over relatively large areas of the peel. The disease stands out in marked contrast to all forms of pitting because of the extent of the areas affected, and the fact that these are never so much or so sharply depressed as in pitting. In mild and typical cases the peel is firm, but in severe cases it may become spongy and soft. The color of the affected peel is seldom as dark as that found in severe pitting.

Brown Stain is a disease that affects oranges while (269)
under refrigeration. It is much more common on fruit held at 32° F. than on that held at higher temperatures, but it has been found to a greater or less degree on fruit held at temperatures as high as 40°, particularly if subjected to air-blast refrigeration.

Other Skin Blemishes.

Aside from the skin blemishes already described under (270)
various headings, there are a number of other injuries, many of which are too difficult to identify or are not of sufficient importance to warrant the inspector's attempting to name them. When such injuries are found in large quantities, a description of the condition will usually suffice. If the inspection is for quality, the inspector must exercise his best judgment in determining whether such blemishes are of sufficient importance to throw the fruit out of grade.

Water Spot.

Water Spot is a disease that develops in California on (271)
mature Washington Navel oranges on the tree, following exposure to 2 or 3 weeks of rainy or foggy weather. In its earliest stage it occurs as a minute cracking of the cuticle, usually near the navel, caused by a swelling of the underlying tissue when it absorbs water. If the wet weather continues, these affected areas enlarge, assume a water-soaked appearance, and are eventually invaded by decay organisms, chiefly Green Mold or Blue Mold. Under extreme conditions half or more of the fruit on a tree may be ruined by this peel breakdown and the rot that follows. Water Spot that develops elsewhere than at the navel end usually starts on bruises or skin breaks.

If the weather turns dry after the first stage of the (272)
spots has developed, the water-soaked areas become brown, dry, and slightly sunken, and active decay of the fruit is prevented. However, some of the blemished fruit may escape notice during the harvesting and packing operations, and so get into the packed boxes. It may also happen that the spots are invaded by fungi, but are kept from decaying by the coming of dry weather. When fruit reaches the packing house, much of the external fungus growth is removed by the brushes and again the damaged fruit may be packed along with sound fruit. In either of these cases, the spots become a potential source of trouble during transit, and on the market, because of the danger of renewed growth of the fungi through the weakened peel whenever conditions become favorable.

(273) Investigations in California show that Water Spot is found in highest percentage in groves sprayed with oil, except where the spray mixture consists of miscible oil and lime-sulphur. On trees where this combination is used, and on trees given other spray treatments, Water Spot develops in only comparatively small amounts. When weather conditions are favorable, the spot may be expected from about the middle of January to the end of the Navel season.

(274) On the market, injuries caused by Water Spot have the appearance of ordinary discolored pits. These would be difficult to diagnose with certainty unless the inspector remembers that the injury occurs only on Washington Navel oranges and is most likely to be seen during the winter months.

Smoky.

(275) The term smoky should be applied only to fruit damaged by smoke from heaters placed in the car, or by other transit conditions.

Membranous Stain.

(276) Membranous Stain is a disease of lemons that is characterized by a browning or darkening of the walls between the segments of the fruit. The central core tissue and the inner portion of the rind are also sometimes affected. The disease can be detected only when the lemons are cut.

(277) Lemons stored at 32°F. remain practically free of the disease, whereas those held at 40° may be seriously damaged by it. At higher temperatures the percentage of affected fruit is much less than at 40°, but not as small as at 32°.

Oil Spotting (Oleocellosis).

(278) Oil Spotting is found on citrus fruit from all producing sections. The commonest form of the injury occurs as circular or irregularly shaped yellow, green, or brown spots in which the oil glands of the skin stand out prominently because of slight sinking of the tissues between them. The yellow spots develop on fully colored mature fruit, whereas the green or brown spots develop on fruit that was green in color when picked. Brown spots are merely a later or older stage of spots that were originally green. Spots seen on fruit on the market are usually not more than 1/2 inch across. Some of those

observed in groves and packing houses are so large as to involve the greater part of the fruit surface. Ultimately all these green spots turn to some shade of brown and occasionally become very dark. In either the green or the brown stage they become more evident after the fruit has been subjected to the degreening process; they are not caused by the process, however but are merely areas where the green color is not decomposed by the gas used for degreening.

Field observations and experimental work indicate that (279)
Oil Spotting is a form of bruising injury produced by handling green citrus fruit. Such fruit is particularly susceptible if handled while wet. The immediate cause of the injury is small quantities of oil that are squeezed out of the oil glands onto the surface of the fruit by the pressure incident to picking and packing. Varieties with raised, prominent oil vesicles are more likely to suffer from Oil Spotting than those with less prominent ones. The spots touched by the oil remain green after the rest of the rind colors up.

Oil Spotting apparently does not injure either the eat- (280)
ing or the keeping quality of citrus fruit, but does detract materially from its appearance and consequently from its market value. Blue Mold or Colletotrichum sometimes invades the larger areas of green spotting, but does so because the part had been bruised rather than because it remained green. The pressure to which fruit is subjected in stacked field boxes or in packed crates will often cause brown, bruised spots to appear at all points where the fruits touch each other or the box. These spots are sometimes known as box scald, but are a form of Oil Spotting.

In Florida, Oil Spotting occurs most commonly during (281)
the fall, that is, during the time when much of the fruit still retains about 50 per cent of its green color. In California, the spotting occurs almost exclusively during the late fall, winter, and early spring, which in general on the Pacific Coast is the season of moist atmosphere conditions due to rain and fogs. Citrus fruit is picked over a longer period in California than in Florida, and some of it may show green color and be susceptible to the spotting at almost any time during the period just mentioned. Oil Spotting is common on limes picked while turgid, in early morning or following extended rains.

Watery Breakdown.

(282) Watery Breakdown is a low temperature disease of citrus fruit. It is most likely to occur in fruit held at 32°F., but is sometimes found at 36° or even at 40°. The longer the storage at these temperatures, the more likely the disease is to develop; particularly susceptible fruit such as that picked late in the season may show it in less than a month. Fruit affected with the disease becomes soft, spongy, and water-soaked, and has the appearance of having been frozen. The diseased condition may be evident either in the peel or in the flesh of the fruit, but more often is found in both. Examination of a cross section of fruit affected with Watery Breakdown shows a general disintegration of the tissues. The segments of the flesh are loosely attached to the inner peel, and when a section of the peel is pressed, a watery substance oozes freely from the inner white portion. Tissue that has collapsed as a result of pitting may become so swollen that the once pitted areas are no longer depressed. Affected fruits held for a short time at room temperature after removal from storage develop a disagreeable odor of fermentation.

(283) At present it is often impossible to distinguish between Watery Breakdown and freezing injury of citrus fruits. Some help in diagnosis may be furnished, however, by the fact that Watery Breakdown would be likely to occur only in fruit that has been in storage for a month or two, whereas freezing injury might be found in newly arrived shipments and also in fruit from storage.

Decay

See Same Heading I.H.B. - Part II

Decay has more effect on the market value of citrus fruit than any other defect. A sufficient number of samples should be examined to give as near as possible an accurate percentage. The sample as a general thing should consist of half boxes when inspecting grapefruit. In other citrus fruit at least fifty specimens should be used as the basis for the sample. However, when unusual or irregular conditions are found, the size of the sample should be increased until the inspector is satisfied that it represents the true condition of the lot. A lot is to be put out of grade on account of decay exceeding double the tolerance in one or more containers only when the entire package is examined.

Alternaria Rot - (Orange): Alternaria Rot of oranges (285) is of two types, one of which occurs in California, the other in Florida and the West Indies. The California type is known as Black Rot and is found chiefly on Navels. It is a firm, dry, slowly developing brownish or black decay at the blossom end of the fruit and is caused by the same fungus that produces the internal and softer breakdown in lemons. The infection takes place through the navel when the fruit is young and is apparently responsible for part of the June drop. Affected fruits that do not drop usually color up ahead of the main crop. They may show the disease only when cut, or they may, in transit or storage, develop a rot that involves the whole blossom end and is visible from the outside. When only the interior of the navel is affected, the tissues are black; when the decay reaches the outside, the skin has a dark brown or sometimes a leaden color. The disease is not common on oranges on the market.

The second type of Alternaria Rot, known as Blossom End (286) Rot, occurs in Florida and the West Indies, chiefly on oranges and very rarely on grapefruit and limes. It is of little importance either in the grove or on the market. The first visible symptoms shown by affected fruits may be any one or various combinations of the following: (1) a reddish-orange color over most of the surface, developing several weeks ahead of the normal yellowish-orange color of the main crop; (2) a slightly softened condition over an area 1/2 inch or more in diameter at the blossom end, sometimes accompanied by browning at the center of the affected area, and a shallow rind rupture across the stylar scar; (3) slight yellowing at the blossom end, with or without browning at the center.

When fruits showing these symptoms, especially the (287) high color, are cut lengthwise, they usually are found to be diseased on the inside, the diseased condition manifesting itself as a gray, pink, or black discoloration and a partial decomposition of the pithy core. On the other hand, fruits showing merely a brown spot or even slight softening at the blossom end are often found to be sound inside when cut. The colors mentioned above are apparently due to the action of specific fungi, since Alternaria is always associated with the gray and black color, and Fusarium with the pink color.

Alternaria also causes a stem end rot of oranfes held (288) too long in cold storage (rarely in less than 2 or 3 months). Usually, however, only a small percentage of such fruit is affected with the rot. It also causes an extensive spotting, in a fan-shaped or circular feathery pattern, on grapefruit and lemons held for 2 or 3 months in cold storage.

(289) Anthracnose (Caused by the Fungus Colletotrichum gloesporioides): Anthracnose of citrus fruits is usually of minor importance, although occasionally in a weakened crop it may become troublesome in storage. While it can attack the fruit at any point, it occurs most commonly in the stem area where it produces a rot that may be confused with the other Stem-End Rots. However, at ordinary temperatures it develops more slowly than these, is drier and firmer, and there is usually a definite line of demarcation between the normal and the affected parts. Ordinarily the latter are slightly sunken and darkened, and the pulpy part of the rind and core become dark olive to black, fading to a pinkish to normal color toward the periphery of the affected parts.

(290) Blue Mold Rot (Caused by Two Fungi Penicillium Italicum and P. Digitatum): Blue Mold is a general term used in referring to either of two rots caused by the fungi mentioned in the heading of this paragraph. The one caused by P. Italicum is blue when sporulating, and the one caused by P. Digitatum is green or olive green. It is not necessary for inspectors to attempt to distinguish between the two in reporting the results of inspection. It is desirable, however, that they have information concerning differences between them.

(291) Both rots first become apparent to casual examination as soft, watery spots in the peel about 1/4 to 1/2 inch in diameter. These constitute the so-called pin-hole rot; under favorable conditions they enlarge within 24 to 36 hours to spots 1 1/2 to 2 inches in diameter that are sometimes known as blister rot. Soon after this stage is reached the mold growth begins to appear on the surface of the decaying areas.

(292) In Green Mold Rot the older portion of the fungus growth has an olive-green color but is usually surrounded by a broad zone of white mycelium, ahead of which is an indefinite band of affected peel. In Blue Mold Rot the fungus growth is blue almost ot its edge, and there is a definite band of water-soaked peel just ahead of the mycelium. The color in each case is the color of the spores of the fungus. The surface of the Green Mold is wrinkled, whereas that of the Blue Mold is powdery or velvety. Green Mold spores are produced on the surface of the fruit, whereas those of Blue Mold are produced on the surface and also in the flesh, sometimes even at or near the center of the fruit. The wrappers adhere closely to fruits rotten by Green Mold, but not to those rotted by Blue Mold.

Both of these fungi enter the fruit readily through (293)
breaks in the skin, hence it is highly important that the
fruit be handled carefully at every step of the harvesting,
packing, and marketing processes. The Blue Mold is also able
to enter directly through the uninjured skin of the fruit, and
for that reason is frequently called the Blue-Contact mold.

Blue Mold and Green Mold Rots are the most common rots (294)
on citrus fruits from California and Texas, but are usually
second to Stem End Rot in importance on fruit from Florida.
In fruit from all three sections Green Mold is more frequently
seen than the Blue-Contact mold. Most of the damage caused by
these rots takes place in transit and storage, although it
frequently seems to be correlated with weather conditions at the
time when the fruit was picked and packed. Fruit harvested
during or just following wet weather frequently suffers severely
later on from these rots.

Control of Blue Mold Rot depends first of all on care- (295)
ful handling throughout the marketing process, in order to keep
the fruit as free as possible of skin breaks and bruises. The
use of borax solutions is helpful in preventing decay, if ap-
plied to the fruit as soon as it arrives at the packing house.

Brown Rot (Caused by a Fungus Phytophthora Citrophthora): (296)
Brown Rot is an orchard disease of economic importance on lemons
and occasionally on other citrus fruits from California. The
causal fungus can enter through uninjured tissues, and is able to
spread from one fruit to another by contact in packed containers
during storage and transit. The disease is characterized by a
brown to chocolate-brown coloration of the skin and a pronounced
rancid odor. The affected areas remain firm and the fruits retain
their shape in cases where practically all of the skin is rotted
and badly discolored. There is no mold visible on the surface
except under humid conditions when a thin, white, velvety growth
may develop over the affected areas.

Rots of Imported Lemons: Imported lemons are attacked by a (297)
variety of fungi. Cultures from several different lots have
shown Gray Mold, Fusarium, Black Mold (Sterigmatocystis), and
Blue Mold, and it is not always possible to say which one is
responsible for the original injury. Probably all of them
contribute to the decay in late stages. Gray Mold Rot in
California citrus fruit and in the clear-cut examples sometimes
found in Italian citrus fruit is marked by a rather dark brown
discoloration followed by a pronounced softening of the fruit,
and finally by the velvety mouse-colored growth characteristic
of this fungus. If all of these signs are found, the disease
can safely be named Gray Mold Rot on the certificate.

When the lemons are nothing but rotten, mouldy lumps (298)
from which the skin is easily peeled in rotten fragments, the
safest procedure is merely to describe the condition.

(299) Stem End Rot (Caused by the Fungi Phomopsis Citri, P. Californica, and Diplodia Natalensis): Stem End Rot caused by Phomopsis Citri and Diplodia Natalensis is a destructive and widely distributed disease of citrus fruit in Florida, Texas, and the West Indies. It is also common and frequently very serious in citrus fruits shipped to market from these regions. Diplodia Rot is sometimes found in California lemons, as is also a less destructive form of Phomopsis Rot caused by P. Californica. Neither of these is as common on California fruit, either in the grove or on the market, as are the corresponding rots on Florida or West Indian fruit.

(300) Typical Stem End Rot, whether caused by Phomopsis or Diplodia, is characterized by a softening of the peel and underlying pulp, which begins almost invariably at the stem end, although it sometimes begins at injuries on the side; at ordinary temperatures it may extend an inch a day so that only 4 or 5 days are required to rot the fruit completely. Neither form of the rot shows much discoloration in the early stages. In late stages the affected peel turns tan color to brown, and sometimes even black. Both rots progress rapidly down the spongy, circular axis, usually reaching the blossom end sooner by this route than through the surface peed; they sometimes show a marked development in the peel along the lines that mark the divisions between the segments of the pulp. Affected fruits do not shrivel or lose their shape unless subjected to pressure, and they ordinarily show no fungus growth on the surface. The taste is flat and somewhat bitter, and affected tissues have an unpleasant, rancid odor. Immature citrus fruit is quite resistant to Stem End Rot, whereas dead ripe fruit is quite susceptible.

(301) Both Phomopsis and Diplodia may occur in the same lot of fruit, but Phomopsis is more frequent in Florida fruit and Diplodia in fruit from Puerto Rico and Cuba. Diplodia is far more prevalent in gassed fruit than is Phomopsis; in ungassed fruit the reverse is true. When both rots occur,, the chief factor determining which will predominate is temperature; the optimum temperature for growth of Diplodia is about 86°F, and for Phomopsis about 73o

G R A D E

A definite statement as to grade should be made under this heading. If the lot or car is out of grade, the reason should be shown. (302)

Examples:

1. Fails to grade U.S. No. 1 account grade defects in excess of tolerance. (303)

2. Now fails to grade U.S. No. 1 only account skin breakdown. (304)

3. Now fails to grade U.S. No. 1 account condition factors named above. (305)

4. Fails to grade U.S. No. 1 account excessive discoloration in excess of tolerance. (306)

5. U.S. No. 1. (307)

Reporting Grade on Combination Grade

Cars are frequently sold on the basis of shipping point certificates showing Combination grade with a given percentage of U.S. No. 1 quality, or on a straight Combination grade. The receiver as a general thing when requesting inspection in the market is only interested in knowing whether the commodity meets the contract. This being the case, it is not necessary to show the actual percentage of U.S. No. 1 quality found unless this is specifically requested. Where cars are sold to contain a higher percentage of U.S. No. 1 quality than the grade specifies, it will be satisfactory to report the grade thus: "U. S. Combination, with at least 60% U.S. No. 1 quality." It is not unusual to find Combination grade cars which lack only a few per cent of grading U.S. No. 1. (308)

When Other Percentage of U.S. No. 1 Quality Are Specified in Combination Grade.

In lots sold with a higher percentage of U.S. No. 1 quality than specified in the Combination Grade, no individual container may have more than 10% below the specified percentage. In other words, a car sold as U.S. Combination 60% U.S. No. 1 quality could not have less than 50% U.S. No. 1 quality in any one container. However, a car showing an average of 60% U.S. No. 1, but having individual containers with more than 10% less than the average may be reported as "U.S. Combination ranging from 45 to 85%, averaging approximately 60% U.S. No. 1 quality." (309)

R E M A R K S

See Same Heading I. H. B. - Part II.

SUPPLEMENT NO. 1

SPECIAL INSTRUCTIONS GOVERNING THE INSPECTION OF CITRUS FOR TREE-FREEZING AND DRYNESS ASSOCIATED WITH TREE FREEZING

For a complete description of the effects of freezing on citrus see article by Dr. D. H. Rose in Division Letter dated Jan. 4, 1935, paragraph 5f.

In making inspections for tree-freezing injury and dryness associated with tree-freezing injury, use a composite sample in determining percentages. Information from shipping sections indicates that there is no material difference in the severity of the injury in the various sizes. Therefore, a flat or approximate average for a brand should be reported with no attempt to show a range. But in selecting samples, every effort should be made to obtain the right proportion of the various sizes.

In determining whether it is necessary to select a composite sample, inspectors should cut a sufficient number of suspicious specimens to determine whether there is any fruit showing dryness or a mushy condition to justify scoring under the grade. If the suspicious specimens are not bad enough to score under the grade, no composite sample is necessary.

In selecting the composite sample for cutting, the following policy should be followed for both regular and appeal inspections:

1. When there is only one brand in car select at random six fruits from each of 12 boxes.

2. When there are two or more brands select five fruits from each of ten boxes from each brand, except in very small lots, where the inspector should use his judgement as to the proper number to be sampled.

Whenever possible the composite sample should be brought to the office for cutting where there will be sufficient light, a place to dispose of the cut fruit and less likelihood of attracting undue attention.

The limits for mushy condition or dryness in the various grades are the volumes equivalent to stem-end segments of the following thickness:

U. S. No. 1 oranges and grapefruit 1/4 inch; Mandarin group oranges 1/8 inch.

U.S. No. 2 and U.S. No. 3 oranges and grapefruit 1/2 inch; Mandarin group 1/4 inch.

If the mushy condition or dryness affects other parts of the fruit than the stem end it will be necessary for the inspector to determine whether the total affected volume is more than the volume of the segment of the prescribed thickness.

In deciding when to score dryness against grade and when against condition it is the policy of the inspection service to allow for possible drying out in transit as follows:

A month or more after a freeze it will be the policy to score against grade, all dryness in excess of the equivalent of 1/4 inch more than the grade permits, that is, the first 1/4 inch in excess of that permitted by the grade should be treated the same as other condition factors and that in excess of 1/4 inch should be scored against grade. All dryness or mushiness should be shown on the certificate under the Condition heading but the percentage in excess of 1/4 inch more than grade permits should be shown separately.

When a lot is out of grade on account of the usual defects and dryness combined, only the usual grade defects should be shown under Quality. Thus: "External grade defects average 5%." The use of the word "External" distinguishes the usual defects from dryness. If the percentage of dryness, in excess of 1/4 inch more than the grade permits, plus the external grade defects, exceeds the tolerance the grade statement should be "Fails to grade U.S. No. 1 account defects including dryness in excess of tolerance." When the dryness which is not in excess of 1/4 inch more than the grade permits plus the usual defects total more than the tolerance, the grade statement should read "Now fails to grade U.S. No. 1 only account dryness."

The following methods should be used in reporting dryness or mushy condition for the various grades:

(1) U. S. No. 1 grade - "Average approximately 15% damaged by dryness, including 5% serious damage."

(2) U. S. Combination - "Average approximately 25% damaged by dryness or mushy condition, including 15% serious damage and 8% affecting more than 3/4 inch."

(3) U. S. No. 2 - "Average approximately 20% serious damage by dryness, including 12% affecting more than 3/4 inch."